

## REMARKS

Claims 1-6 and 10-12 were pending up to this Amendment and Response.

Claims 1-6 and 10-12 are rejected.

Claim 10 is amended.

Claims 55-57 are added.

Claims 1-6, 10-12, and 55-57 are pending as a result of this Amendment and Response.

### I. Inventorship

The Examiner indicated a belief that the application currently names joint inventors. The Examiner is alerted that inventorship was amended as a result of the election in response to the restriction requirement. As a result, the application currently names only one inventor.

### II. Rejection of claims under §103 based on Yamamoto

The Examiner rejected claims 1-6 and 10-12 as being obvious, citing only one reference – U.S. Pat. No. 6,246,618 by Yamamoto. Regarding claims 1-6, Applicant contends that those claims contain limitations that the Examiner and Yamamoto fail to address. Moreover, a careful reading of Yamamoto indicates the Examiner has misinterpreted that reference. Still further, the careful reading of Yamamoto demonstrates that it actively teaches away from at least one limitation in those claims.

Focusing on claim 1 limitations not addressed by the Examiner, Applicant notes that claim requires an act of allowing a memory die to be placed *in a location outside of a production facility of that die*. The Examiner does not appear to have addressed that limitation in the Office Action dated 9/30/04, nor can Applicant find relevant teaching in Yamamoto. (While Yamamoto refers to a computer allowed to execute memory repair (Yamamoto at col. 4, ln. 8-10), Applicant contends such does not address claim 1's "location" limitation with respect to the die and the production facility.) Claim 1's testing act also addresses the "location" limitation; accordingly, neither the Examiner nor Yamamoto appear to address that limitation as well.

The Examiner expressly admits that Yamamoto fails to disclose claim 1's act of storing a partial memory cell address on the die as a result of testing. (Office Action dated 9/30/04 at p. 3.)

The Examiner in fact goes further, stating that Yamamoto does not teach storing the repair code signal in general. (*Id.*) Applicant submits that the Examiner's broad statement misinterprets Yamamoto. A careful reading of Yamamoto not only reveals such but also demonstrates Yamamoto's teaching away from claim 1's storing act. Contrary to the Examiner's interpretation, Yamamoto expressly teaches providing a repair code register 101 which stores data for the repair code signal. (*See* Yamamoto at col. 12, ln. 14-22; FIG. 11.) Contrary to claim 1, however, Yamamoto's register 101 is on the circuit board 100 yet off the RAMs 10-13. (*Id.*)

Not only does such disclosure demonstrate that the Examiner's interpretation of Yamamoto is incorrect and that Yamamoto actively teaches away from claim 1, such disclosure renders untenable the Examiner's opinion concerning the motivation for modifying Yamamoto (*see* Office Action dated 9/30/04 at p. 3). Moreover, such disclosure further demonstrates Yamamoto's failure to address other limitations of claim 1, such as the specific information stored on die -- a partial memory cell address. Applicant notes that the Examiner also failed to address on-die storage of this specific information as well, despite the Examiner's attempt to modify Yamamoto.

Thus, claim 1's limitations that the Examiner fails to address demonstrate that the Examiner has not met the burden for rejection. The Examiner's misinterpretation of Yamamoto further demonstrates that the burden for rejection has not been met. Moreover, Yamamoto's failure to address some of claim 1's limitations and outright teaching away from at least one of claim 1's limitations demonstrate that the burden for rejection cannot be met relying on Yamamoto. Dependent claims 2-6 benefit accordingly.

Moreover, dependent claims 2-6 express additional limitations that the Examiner has failed to address and/or Yamamoto appears to not teach. For example, neither the Examiner nor Yamamoto appear to address claim 3's limitation concerning testing a memory die while its electronic system is in a power management mode. Claim 5 requires testing a memory die while it is part of a telephone system. The Examiner announced that Yamamoto teaches its RAMs 11-13 can be part of a telephone system (Office Action dated 9/30/04 at p. 3). However, the Examiner failed to cite any relevant excerpt from Yamamoto, and Applicant can find no reference to a phone in Yamamoto's disclosure. If the Examiner is asserting that Yamamoto's RAM can somehow be transplanted into a telephone system based on the Examiner's own knowledge and experience, Applicant contends such an assertion is legally improper in light of

binding case precedent. (See *In re Zurko*, 258 F.3d 1379, 59 U.S.P.Q.2d 1693, 1697 (Fed. Cir. 2001) (prohibiting the Examiner from simply reaching conclusions based on personal understanding or experience and instead requiring the Examiner to point to concrete evidence in record). A copy of *Zurko* is included in an appendix to this Amendment.) Applicant contends such binding case precedent requires the Examiner cite evidence in the record supporting such a modification of Yamamoto. Moreover, the Examiner is further bound by case precedent to consider whether conflicts between Yamamoto and such additional evidence discourage combination. (See *In re Young*, 927 F.2d 588, 18 U.S.P.Q.2d 1089, 1091 (Fed. Cir. 1991) (requiring the Examiner to consider the inability of conflicting references to suggest solutions to one of ordinary skill in the art, and to specifically consider whether one reference discredits another). A copy of *Young* is included in an appendix to this Amendment.) Dependent claim 6 benefits accordingly and, for the same reasons presented in support of claim 5, further benefits from its expressed narrower limitation that the die be part of a *cellular* telephone system. As a result, the dependent claims' expressed limitations that the Examiner and/or Yamamoto fail to address further demonstrate that the Examiner has not met and cannot meet the burden for rejecting the claims relying on Yamamoto.

As for claim 10, it has been clarified to indicate that the act of transmitting to memory circuits incorporated into an electronic system occurs *while the memory circuits are in the field*. Applicant can find no excerpt in Yamamoto addressing claim 10's "in-field" limitation and contends that not even Yamamoto's reference to a computer allowed to execute memory repair (Yamamoto at col. 4, ln. 8-10) sufficiently addresses the "in-field" limitation as defined in paragraph [0086]-[0089] of the Specification. Dependent claims 11-12 benefit accordingly.

### Conclusion

In light of the above amendments and remarks, Applicant submits that the claims are allowable over the rejections and applied reference. Therefore, Applicant respectfully requests reconsideration of the Examiner's rejections and further requests allowance of all of the pending claims. If there are any matters which may be resolved or clarified through a telephone interview, the Examiner is requested to contact Applicant's undersigned attorney at the number indicated.

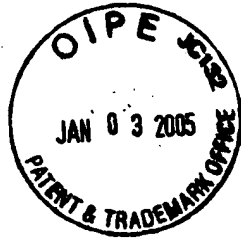
Respectfully submitted,



Dated 12/29/14

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Appendix 1:

*In re Zurko*, 258 F.3d 1379, 59 U.S.P.Q.2d 1693 (Fed. Cir. 2001)



59 U.S.P.Q.2d 1693  
 258 F.3d 1379, 59 U.S.P.Q.2d 1693  
 (Cite as: 59 U.S.P.Q.2d 1693)

Page 1

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In re Zurko

U.S. Court of Appeals Federal Circuit

No. 96-1258

Decided August 2, 2001

**PATENTS**

[1] Patentability/Validity -- Obviousness --  
 Combining references (§ 115.0905)

**JUDICIAL PRACTICE AND PROCEDURE**

Procedure -- Judicial review -- Standard of  
 review --Patents (§ 410.4607.09)

Decision of Board of Patent Appeals and Interferences sustaining obviousness rejection of patent application for method of improving security in computer system is reversed, even though board's factual findings underlying its determination are reviewed under "substantial evidence" standard, since prior art references relied upon by board do not teach limitation requiring communications between user and "trusted" environment along "trusted" path, and since deficiencies of references cannot be remedied by reliance upon additional combination of alternative references cited for first time on appeal, or by board's general conclusion, unsupported by evidence in record, that requiring communication with trusted environment over trusted path would be "basic knowledge" or "common sense" to person of ordinary skill in art; although board's expertise alone may provide sufficient support for conclusions as to peripheral issues, its core factual findings in patentability determinations must be supported by concrete evidence in record.

On remand from the U.S. Supreme Court.

Patent application of Mary E. Zurko, Thomas A.

Casey Jr., Morie Gasser, Judith S. Hall, Clifford E. Kahn, Andrew H. Mason, Paul D. Sawyer, Leslie R. Kendall, and Steven B. Lipner, serial no. 07/479,666 (method for improving security in a computer system). Board of Patent Appeals and Interferences sustained examiner's rejection of application under 35 U.S.C. § 103. The U.S. Court of Appeals \*1694 for the Federal Circuit reversed on appeal ( 42 USPQ2d 1476). On rehearing en banc, the Federal Circuit held ( 46 USPQ2d 1691) that proper standard of review for fact findings underlying patentability determinations by Patent and Trademark Office is "clearly erroneous" standard, rather than more deferential standard found in Administrative Procedure Act. The U.S. Supreme Court reversed the Federal Circuit's en banc decision and remanded, holding ( 50 USPQ2d 1930) that PTO's findings of fact must be reviewed under either "substantial evidence" or "arbitrary and capricious" APA standards of review. On remand, the Federal Circuit again reverses board's decision.

Linda Moncys Isacson, associate solicitor, John M. Whealan, solicitor, and Kenneth R. Corsello and Thomas J. Finn, associate solicitors, U.S. Patent and Trademark Office, Arlington, Va., for Commissioner of Patents and Trademarks.

John F. Sweeney, Michael O. Cummings, Jon T. Hohenthaler, Israel Blum, Steven F. Meyer, and Brenda Pomerance, of Morgan & Finnegan, New York, N.Y.; Irene Kosturakis and Russell T. Wong, of Compaq Computer Corp., Houston, Texas; Ernest Gellhorn, Washington, D.C.; Janice M. Mueller, of Suffolk University Law School, Boston Mass.; Ronald C. Hudgens, of Digital Equipment Corp., Maynard, Mass., for Mary E. Zurko et al.

Before Newman, circuit judge, Archer, senior circuit judge, and Michel, circuit judge.

Archer, S.J.

This case is before us on remand from the Supreme Court of the United States. *Dickinson v. Zurko*, 527 U.S. 150, 50 USPQ2d 1930 (1999) ("

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59 U.S.P.Q.2D 1693  
 258 F.3d 1379, 59 U.S.P.Q.2d 1693  
 (Cite as: 59 U.S.P.Q.2d 1693)

Page 2

*Zurko III*"). In *Zurko III*, the Court reversed our judgment and remanded the case because we had reviewed the factual findings of the Board of Patent Appeals and Interferences ("Board") for clear error, an incorrect standard of review.

The Board decision at issue, *Ex parte Zurko*, No. 94-3967 (Bd. Pat. Apps. & Int. Aug. 4, 1995), sustained the rejection of U.S. Patent Application No. 07/479,666 ("the '666 application") under 35 U.S.C. § 103 (1994). In our initial review of this decision, we determined that the Board's findings were clearly erroneous and we reversed. *In re Zurko*, 111 F.3d 887, 42 USPQ2d 1476 (Fed. Cir. 1997) ("*Zurko I*"). At the Commissioner's suggestion, we then reheard this case en banc to reconsider the question of the appropriate standard of review. The Commissioner argued that Board findings should be reviewed under the standards of the Administrative Procedure Act (APA), namely the substantial evidence or arbitrary and capricious standard. 5 U.S.C. § 706 (1994). The en banc court held, however, that clear error was the correct standard of review for Board findings of fact and adopted the conclusions of the original panel decision. *In re Zurko*, 142 F.3d 1447, 46 USPQ2d 1691 (Fed. Cir. 1998) ("*Zurko II*").

The Commissioner then petitioned for review by the Supreme Court, and the Court reversed, holding that Board findings of fact must be reviewed under the APA standards of review. The Court did not specify which APA standard of review to apply, substantial evidence or arbitrary and capricious. We subsequently decided this question in *In re Gartside*, 203 F.3d 1305, 53 USPQ2d 1769 (Fed. Cir. 2000), and held that substantial evidence is the correct APA standard of review for Board factual findings.

We now revisit the merits of our decision in *Zurko I*, applying the proper APA standard of review. In doing so, we conclude that the outcome of this case does not change with the application of this new standard of review. Because the factual findings underlying the Board's decision are not supported by substantial evidence, we reverse.

#### BACKGROUND

The '666 application concerns a method for more efficiently creating a secure computer environment.

Secure, or "trusted," computer environments employ trusted software designed to preclude unauthorized users and to prevent unintended or unauthorized commands. Such trusted software is often quite costly, compared to untrusted software, so it is desirable to minimize the amount of trusted software in the system. Applicants claim a method for processing trusted commands with a minimum of trusted software.

Representative claim one reads as follows:

1. A machine-executed method for executing a trusted command issued by a user on a computer system, the computer system including an untrusted computing environment and a trusted computing environment, said method comprising the steps of:

\*1695 (a) parsing the trusted command in the untrusted computing environment to generate a parsed command;

(b) submitting the parsed command to the trusted computing environment;

(c) displaying a representation of the trusted command to the user through a trusted path;

(d) receiving a signal from the user through a trusted path signifying whether the displayed representation accurately represents the user's intentions;

(e) if the signal signifies that the displayed representation does not accurately represent the user's intentions, then preventing the execution of the parsed command;

(f) if the signal signifies that the displayed representation accurately represents the users intentions, executing the parsed command in the trusted environment.

As set forth in claim one, applicants' method involves processing and verifying a trusted command using both trusted and untrusted software. A trusted command is first processed by untrusted software to create a parsed command. The parsed command is then submitted to the trusted computer environment. Execution of this command requires verification along a trusted path. The parsed

59 U.S.P.Q.2D 1693  
 258 F.3d 1379, 59 U.S.P.Q.2d 1693  
 (Cite as: 59 U.S.P.Q.2d 1693)

Page 3

command is relayed to the user along a trusted path, and, if correct, the user can send a confirming signal back along this trusted path, allowing execution of the command. By processing a trusted command in this manner, the applicants contend they reduce the amount of trusted software. The applicants assert that the parsing step generally requires a large amount of software and that performing this step with untrusted software greatly reduces the amount of trusted code required to process a trusted command.

The Board sustained the Examiner's rejection of claims 1, 4, and 5 of the '666 application under 35 U.S.C. § 103 based on two prior art references. The primary reference is the UNIX operating system, as described in the applicants' information disclosure statement ("IDS"). According to this description, the UNIX system employs both untrusted and trusted code. Furthermore, certain commands in a UNIX system may be parsed in an untrusted environment, and then these parsed commands may be executed by "calling a trusted service that executes in a trusted computing environment."

The secondary reference, also described in applicants' IDS, is Dunford, FILER Version 2.20 ("FILER2"). This program repeats back potentially dangerous commands, requesting confirmation from the user before execution.

Considering the teachings of these two references, the Board concluded that the invention claimed by the '666 application would have been obvious. The Board commented that "the artisan would have been led from these teachings to take the trusted command parsed in an untrusted environment and submitted to the trusted computing environment, as taught by UNIX, and to display the parsed command to the user for confirmation prior to execution, as suggested by [FILER2]." *Ex parte Zurko*, slip op. at 6-7. According to the Board, this combination would render the claimed invention obvious.

The Board also responded to applicants' arguments that neither reference discloses a trusted path communication to the user and that no teaching of the prior art references motivates the combination of these references to create the claimed invention. The Board said that communication along a trusted

path, if not explicit in the prior art, is either inherent or implicit. *Id.* at 7. The Board further adopted the Examiner's assertion that "it is basic knowledge that communication in trusted environments is performed over trusted paths." *Id.* at 8. As for the motivation to combine these references, the Board concluded that it "would have been nothing more than good common sense" to combine the teachings of these references. *Id.* The Board noted that FILER2 taught the verification of dangerous commands in general, suggesting verification of the parsed command submitted to the trusted computing environment in UNIX. Because this verification occurs within a trusted environment, it is "basic knowledge," according to the Board, that this verification would occur along a trusted path. *Id.* at 7-8.

Reviewing the Board's decision in *Zurko I*, we held that "the Board's finding that the prior art teaches, either explicitly or inherently, the step of obtaining confirmation over a trusted pathway [was] clearly erroneous." *Zurko I*, 111 F.3d at 889, 42 USPQ2d at 1478. Indeed, we noted that neither reference relied upon by the Board taught communication with \*1696 the user over a trusted pathway. *Id.*, 42 USPQ2d at 1479. We further held that the Board clearly erred in finding that the prior art teaches communicating with the user over both a trusted and an untrusted path. This finding was in conflict with the Board's other finding that trusted communications must be over trusted paths. *Id.* at 890, 42 USPQ2d at 1479.

On remand, applicants urge that we maintain our reversal of the Board's decision, arguing that the decision is legally flawed, or, alternatively, that the Board's factual findings fail under the APA standard of review. The Commissioner responds that we must affirm the Board decision because its findings are supported by substantial evidence in the record.

## DISCUSSION

A claimed invention is unpatentable for obviousness if the differences between it and the prior art "are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art." 35 U.S.C. § 103(a) (1994); *Graham v. John Deere Co.*, 383 U.S. 1, 14, 148 USPQ 459, 465



59 U.S.P.Q.2D 1693  
 258 F.3d 1379, 59 U.S.P.Q.2d 1693  
 (Cite as: 59 U.S.P.Q.2d 1693)

Page 4

(1966). Obviousness is a legal question based on underlying factual determinations including: (1) the scope and content of the prior art, including what that prior art teaches explicitly and inherently; (2) the level of ordinary skill in the prior art; (3) the differences between the claimed invention and the prior art; and (4) objective evidence of nonobviousness. *Graham*, 383 U.S. at 17-18, 148 USPQ at 467; *In re Dembiczak*, 175 F.3d 994, 998, 50 USPQ 1614, 1616 (Fed. Cir. 1999); *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995) (stating that the inherent teachings of a prior art reference is a question of fact). We review the ultimate legal determination of obviousness without deference. *In re Dembiczak*, 175 F.3d at 998, 50 USPQ at 1616. We review factual findings underlying this determination for substantial evidence. *In re Gartside*, 203 F.3d at 1311-16, 53 USPQ2d at 1772-75.

Substantial evidence is "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938); see also *Zurko III*, 527 U.S. at 162, 50 USPQ2d at 1772-75. A review under this standard "involves an examination of the record as a whole, taking into consideration evidence that both justifies and detracts from the agency's decision." *In re Gartside*, 203 F.3d at 1312, 53 USPQ2d at 1773 (citing *Universal Camera Corp. v. NLRB*, 340 U.S. 474, 487-88 (1951)). In addition, "the possibility of drawing two inconsistent conclusions from the evidence does not prevent an administrative agency's finding from being supported by substantial evidence." *Consolo v. Fed. Maritime Comm'n*, 383 U.S. 607, 619-20 (1966).

The substantial evidence standard has been analogized to the review of jury findings, and it is generally considered to be more deferential than the clearly erroneous standard of review. *Zurko III*, 527 U.S. at 162-63, 50 USPQ2d at 1936. The Supreme Court noted in *Zurko III*, however, that this generally recognized difference is "a subtle one," so fine that in its review of case law in the *Zurko III* decision, the Court could not find any other case where a reviewing court had conceded that the standard of review made a difference. *Id.* Moreover, while appellate courts must respect agency expertise, the Court has "stressed the importance of

not simply rubber-stamping agency fact finding." *Id.* (citing *Universal Camera*, 340 U.S. at 477-78). Indeed, the Court observed that Federal Circuit judges "will examine [Board fact] findings through the lens of patent-related experience -- and properly so, for the Federal Circuit is a specialized Court." *Id.* The Court further noted that this "comparative expertise, by enabling the Circuit better to understand the basis for the [Board's] finding of fact, may play a more important role in assuring proper review than would a theoretically somewhat stricter standard." *Id.*

With this guidance from the Supreme Court in mind, we now reconsider the Board's decision. Applicants urge that we reaffirm our conclusion in *Zurko I*, alleging numerous legal and factual errors in the Board decision. These arguments center around two issues. First, applicants argue that the prior art relied upon by the Board does not disclose one of the limitations of their claimed invention, namely communication between a trusted environment and the user along a trusted path. Second, applicants claim that there is no substantial evidence support for the Board's finding of motivation to combine the cited references to yield the claimed invention. We only need to consider the first issue raised by applicants.

As to this first issue, the Commissioner apparently concedes that neither the UNIX IDS disclosure nor FILER2 teaches communications between the user and the trusted environment along a trusted path. Nevertheless, the Commissioner maintains that the Board's findings concerning the content of the prior art are supported by four other references in the record. [FN1][1] As to this first issue, the Commissioner apparently concedes that neither the UNIX IDS disclosure nor FILER2 teaches communications between the user and the trusted environment along a trusted path. Nevertheless, the Commissioner maintains that the Board's findings concerning the content of the prior art are supported by four other references in the record. [FN1] The Commissioner argues that these additional references describe modified UNIX systems that allow communication over both trusted and untrusted paths. Therefore, the Commissioner argues, the Board's general findings concerning the content of the prior art

59 U.S.P.Q.2d 1693  
 258 F.3d 1379, 59 U.S.P.Q.2d 1693  
 (Cite as: 59 U.S.P.Q.2d 1693)

Page 5

have substantial evidence support, as does its ultimate conclusion of obviousness.

We are unpersuaded by the Commissioner's arguments. The Board's conclusion of obviousness was based on the UNIX and FILER2 references. The Board's findings with respect to these references simply cannot be supported by the alternative references identified by the Commissioner on remand. To the contrary, these alternative references merely confirm the well-known fact that conventional UNIX systems do not allow communication between the user and the trusted environment along a trusted path. For example, Johrie et al., U.S. Pat. No. 4,918,653, comments that "[s]ome examples of prior art multi-user operating systems which have not provided an effective mechanism for establishing a trusted path include UNIX . . . ." Johrie, col. 1, II. 60-63.

The Commissioner also cannot now mend the Board's faulty conclusion of obviousness by substituting these alternative references for those relied upon by the Board. This new combination of references would constitute a new ground for rejection, not considered or relied upon by the Examiner or the Board. It is well settled that it would be inappropriate for us to consider such a new ground of rejection. *In re Margolis*, 785 F.2d 1029, 1032; 228 USPQ 940, 942 (Fed. Cir. 1986); see also *Koyo Seiko Co., Ltd. v. United States*, 95 F.3d 1094, 1099 (Fed. Cir. 1996) (holding that "[t]he grounds upon which an administrative order must be judged are those upon which the record discloses that its action was based.") (quoting *SEC v. Chenery Corp.*, 318 U.S. 80, 87 (1943)).

Finally, the deficiencies of the cited references cannot be remedied by the Board's general conclusions about what is "basic knowledge" or "common sense" to one of ordinary skill in the art. As described above, the Board contended that even if the cited UNIX and FILER2 references did not disclose a trusted path, "it is basic knowledge that communication in trusted environments is performed over trusted paths" and, moreover, verifying the trusted command in UNIX over a trusted path is "nothing more than good common sense." *Ex parte Zurko*, slip op. at 8. We cannot accept these findings by the Board. This assessment

of basic knowledge and common sense was not based on any evidence in the record and, therefore, lacks substantial evidence support. As an administrative tribunal, the Board clearly has expertise in the subject matter over which it exercises jurisdiction. This expertise may provide sufficient support for conclusions as to peripheral issues. With respect to core factual findings in a determination of patentability, however, the Board cannot simply reach conclusions based on its own understanding or experience -- or on its assessment of what would be basic knowledge or common sense. Rather, the Board must point to some concrete evidence in the record in support of these findings. [FN2] To hold otherwise would render the process of appellate review for substantial evidence on the record a meaningless exercise. *Baltimore & Ohio R.R. Co. v. Aderdeen & Rockfish R.R. Co.*, 393 U.S. 87, 91-92 (1968) (rejecting a determination of the Interstate Commerce Commission with no support in the record, noting that if the Court were to conclude otherwise "[t]he requirement for administrative decisions based on substantial evidence and reasoned findings -- which alone make effective judicial review \*1698 possible -- would become lost in the haze of so-called expertise"). Accordingly, we cannot accept the Board's unsupported assessment of the prior art.

## CONCLUSION

The Board's conclusion of obviousness was based on a misreading of the references relied upon and, therefore, lacks substantial evidence support. Accordingly, the Board's judgment is reversed.

*REVERSED.*

FN1. Specifically, the Commissioner points to Johrie et al., U.S. Pat. No. 4,918,653; E.J. McCauley et al., *KSOS: The Design of a Secure Operating System*, Ford Aerospace and Communications Corp. (1979); Stanley R. Ames, Jr. et al., *Security Kernel Design and Implementation: An Introduction*, IEEE Cat. No. 830700-001 (July 1983); and Simon Wiseman et al., *The Trusted Path Between Smite and the User*, Proceedings 1988 IEEE Symposium on Security and Privacy (April 18-21, 1988).

59 U.S.P.Q.2D 1693  
258 F.3d 1379, 59 U.S.P.Q.2d 1693  
(Cite as: 59 U.S.P.Q.2d 1693)

Page 6

FN2. As described above, we cannot accept the Commissioner's invitation to now search the record for references in support of the Board's general conclusions concerning the prior art. Even if any such references could support these conclusions, it would be inappropriate for us to consider references not relied upon by the Board. *In re Margolis*, 785 F.2d at 1032; 228 USPQ at 942.

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59 U.S.P.Q.2D 1693

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Appendix 2:

*In re Young*, 927 F.2d 588, 18 U.S.P.Q.2d 1089 (Fed. Cir. 1991)

Westlaw.

18 U.S.P.Q.2d 1089  
 927 F.2d 588, 18 U.S.P.Q.2d 1089  
 (Cite as: 18 U.S.P.Q.2d 1089)

Page 1

C

In re Young

Court of Appeals, Federal Circuit

No. 90-1368

Decided March 5, 1991

United States Patents Quarterly Headnotes

**PATENTS****[1] Patentability/Validity - Obviousness - Relevant prior art - In general (§ 115.0903.01)**

Apparently conflicting prior art references must, in making obviousness determination, each be weighed for their power to suggest solutions to artisan of ordinary skill, and all disclosures in prior art must be considered to extent that they are in analogous fields of endeavor and thus would have been considered by person of ordinary skill in field of invention; in weighing suggestive power of each reference, degree to which one reference might accurately discredit another must be considered.

**PATENTS****[2] Patentability/Validity - Obviousness - Relevant prior art - Particular inventions (§ 115.0903.03)**

Applicant's claims for method of generating seismic pulse in water by use of at least three air guns disposed at critical distance from each other are obvious in view of prior patent which expressly teaches exact spacing set forth as limitation in each of applicant's claims, even though additional reference purporting to test different methods of pulse generation suggests avoidance of spacing taught in prior patent, since reference did not accurately test prior patent according to its teachings, particularly those regarding spacing, and

therefore artisan of ordinary skill would have afforded reference little weight.

**\*1090** Appeal from the U.S. Patent and Trademark Office, Board of Patent Appeals and Interferences.

Patent application of D. Raymond Young and John C. Wride (method and apparatus for generating an acoustic pulse in a body of water). From decision of Board of Patent Appeals and Interferences upholding final rejection of all claims, applicants appeal. Affirmed.

Richard F. Phillips, Jr., Houston, Texas, for appellants.

Lee E. Barrett, associate solicitor (Fred E. McKelvey, solicitor, with him on brief), Arlington, Va., for appellee Patent and Trademark Office.

Before Newman, Lourie, and Rader, circuit judges.

Rader, J.

Raymond Young and his co-inventor John Wride (collectively Young) appeal from the October 31, 1989 and April 18, 1990 decisions of the Board of Patent Appeals and Interferences (Board). These decisions affirmed the final rejection of all claims in their application. The Board held Young's claimed invention obvious under 35 U.S.C. §103. This court affirms.

**BACKGROUND**

Young's application discloses a method and apparatus for generating an acoustic pulse in water. Acoustic pulse technology facilitates offshore seismic exploration. The acoustic pulse generates a large gas bubble in the ocean above geological formations on the ocean floor. The rapid expansion and collapse of the gas bubble create a shock wave in the water. The shock wave propagates through the water into the formations below the ocean bed.

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18 U.S.P.Q.2d 1089  
 927 F.2d 588, 18 U.S.P.Q.2d 1089  
 (Cite as: 18 U.S.P.Q.2d 1089)

Page 2

As the shock wave passes downward through these formations, each interface between adjoining earth strata reflects a portion of the shock wave. These reflections move upward through the ocean. Hydrophones at the ocean's surface can monitor these reflections. From these monitored reflections, geologists can generate a "seismic section" map which shows the configuration of strata in the ocean bed.

Today's most common sources of seismic shock waves are air guns. These air guns feature a chamber for storing and releasing on command highly compressed air. A high-pressure hose charges the gun with compressed air for rapid firing during a seismic survey.

Acoustic pulse technology suffers from problems with bubble oscillation. Upon release of the compressed air, the bubble undergoes a rapid initial expansion and collapse. Several more expansions and collapses follow the initial collapse, but with diminishing amplitude. Each of these expansion-collapse events creates an additional shock wave. The geological strata reflect each of these additional shock waves. The multiple reflections, in turn, blur the resolution of the seismic section. Most blurring comes from the first oscillation after the initial bubble collapse.

Acoustic pulse technology uses a "primary-to-bubble ratio" to measure susceptibility to oscillation. This ratio compares the shock wave intensity of the initial expansion-collapse to the intensity of the first oscillation. A high ratio means the secondary shock waves are less likely to blur the seismic section.

Young tries to raise the primary-to-bubble ratio above prior art air gun sources by reducing the amplitude of the first oscillation. Young seeks this result by spacing at least three air guns in a characteristic array. The array separates the guns from each other by a critical distance. The distance,  $D$ , is at least 1.2 times greater than  $R$ , but less than or equal to twice  $R$ .  $R$  is the maximum radius of the initial air bubble from each gun. [FNa1] With this spacing, the bubbles from each gun intersect before any single bubble reaches its maximum radius. This intersection dampens the overall oscillation. Young's independent claims each include a spacing

limitation within this range.

Independent claim 1 is illustrative: A method of producing a seismic pulse in a body of water, including the steps of:

(a) disposing in the water a set of at least three air guns, each adapted to produce in the water a gas bubble having maximum radius substantially equal to the quantity  $R$ , where the guns are disposed at depths such that each produces, when fired, a bubble of maximum radius  $R$ , and the guns are disposed such that each gun is separated from each of the nearest guns thereto in the set by a critical distance,  $D$ , where  $D$  is substantially equal to  $\sqrt{2}R$ ; and

(b) firing the air guns substantially simultaneously to produce a seismic pulse in the water.

**\*1091** Young's dependent claims define the number of the guns or their placement relative to each other or to the ocean surface.

The examiner rejected each of the claims as obvious under 35 U.S.C. §103 in light of five prior art references. The examiner relied primarily on U.S. Patent No. 2,619,186 to Carlisle (the "Carlisle patent" or "Carlisle") to reject Young's claims. Carlisle is the only reference cited by the examiner or Board which suggests the air gun spacing in Young's claims.

Young contested the Board's and the examiner's consideration of Carlisle. Young argued that Carlisle concerns reducing bubble oscillation for chemical explosives, not air guns. Young also argued that an article by Knudsen published six years after Carlisle in the journal *Geophysics* expressly discredits the teachings of Carlisle. W. Knudsen, *Elimination of Secondary Pressure Pulses in Offshore Exploration (A Model Study)*, 23 *Geophysics* No. 3 at 440 (July 1958) (Knudsen). Therefore, Young contended, a person of ordinary skill in the seismic exploration art would not have considered Carlisle when developing an improved seismic array.

The Board rejected Young's arguments. The Board held that the examiner appropriately applied

18 U.S.P.Q.2d 1089  
 927 F.2d 588, 18 U.S.P.Q.2d 1089  
 (Cite as: 18 U.S.P.Q.2d 1089)

Page 3

Carlisle notwithstanding the teachings of Knudsen. On appeal, Young asserts as error only the propriety of applying Carlisle as a reference in light of Knudsen's allegedly contrary teachings.

#### DISCUSSION

This court must decide whether the Board properly affirmed the examiner's rejection over Carlisle. Young has not challenged the other references cited in the examiner's rejection. Further, Young has not argued the merits of any particular claim apart from the others. Therefore, all claims stand or fall together with representative independent claim 1. See *In re Kaslow*, 707 F.2d 1366, 1376, 217 USPQ 1089, 1096 (Fed. Cir. 1983).

The Carlisle patent - "Seismic Exploration Method" - issued on November 25, 1952. Carlisle concerns minimizing bubble oscillation for chemical explosives used in marine seismic exploration. Carlisle controls bubble oscillation by spacing seismic sources to achieve a reduction of the secondary pressure pulse. Carlisle specifically teaches spacing the seismic sources close enough to allow the bubbles to intersect before reaching their maximum radius. Carlisle spaces the bubble centers closer than two maximum bubble radii, or less than "2.0 R" in Young's notation. Carlisle, col. 3, lines 57-60. Carlisle explains:

[T]he secondary energy normally available from these sources is dissipated by their mutual intersection and tends to eliminate the secondary seismic impulses created when the walls of the bubbles collapse.

*Id.* at lines 60-64. Thus, Carlisle expressly teaches the spacing limitation in each of Young's claims.

Notwithstanding Carlisle's teachings, Young argues that the Knudsen article discredits Carlisle. Knudsen describes a series of tests which evaluated four proposed techniques for suppressing bubble oscillation. Carlisle was one of the four. Knudsen's article opined that Carlisle yields no appreciable improvement in bubble oscillation suppression. The effective teaching of the Knudsen/Carlisle combination, Young argues, suggests avoidance of the spacing suggested in Carlisle. Therefore, Young would have this court conclude that his use of Carlisle's spacing would not have been obvious.

Young misunderstands the effect that Knudsen has on Carlisle. The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). Even if tending to discredit Carlisle, Knudsen cannot remove Carlisle from the prior art. Patents are part of the literature of the art and are relevant for all they contain. *In re Lemelson*, 397 F.2d 1006, 1009, 158 USPQ 275, 277 (CCPA 1968). For example, in *In re Etter*, 756 F.2d 852, 859, 225 USPQ 1, 6 (Fed. Cir.), cert. denied, 474 U.S. 828 (1985), a reference which disclosed obsolete technology remained in the prior art. This court considered the reference for what it disclosed in relation to the claimed invention.

[1] When prior art contains apparently conflicting references, the Board must weigh each reference for its power to suggest solutions to an artisan of ordinary skill. The Board must consider all disclosures of the prior art, *In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976), to the extent that the references are, as here, in analogous fields of endeavor and thus would have been considered by a person of ordinary skill in the field of the invention. The Board, in weighing the suggestive power of each reference, must consider the degree to which one reference might accurately discredit another.

[2] As prior art, the Board correctly weighed Carlisle to determine the patentability of Young's claims. Carlisle expressly teaches both the method and the advantages \*1092 of Young's claimed spacing. In fact, Carlisle expressly teaches the exact spacing set out as a limitation in Young's claims. Thus, the Board correctly attributed significant weight to Carlisle in its obviousness determination.

In determining what weight to accord to Carlisle as prior art, the Board also appropriately considered Knudsen's discrediting effect. The Board determined that Knudsen did not convincingly discredit Carlisle. Therefore, the Board appropriately concluded that Knudsen would not have led one skilled in the art to reject Carlisle.

Knudsen did not test Carlisle according to its teachings. For instance, Knudsen did not use an

18 U.S.P.Q.2d 1089  
 927 F.2d 588, 18 U.S.P.Q.2d 1089  
 (Cite as: 18 U.S.P.Q.2d 1089)

Page 4

explosive charge in modeling Carlisle. Rather, Knudsen tried to simulate Carlisle with a capacitive electrical discharge in a barrel of oil.

Knudsen did not replicate Carlisle's teachings on spacing. Knudsen tried to model Carlisle by separating the seismic sources by one, two and three bubble radii. Knudsen at 42. At the maximum spacing of three bubble radii, the bubbles will not intersect at all. Carlisle specifically requires spacing to permit bubble intersection. Carlisle, col. 4, lines 47-52. At a spacing of one bubble radius, the two bubbles coalesced into one before the initial collapse. Knudsen at 45. If just one bubble is present, the bubble will oscillate as if no second seismic source was present. Carlisle specifically requires spacing to prevent the formation of one bubble. Carlisle, col. 4, lines 34-37. Finally, at the two bubble radii spacing in Knudsen, the bubbles will just barely intersect. Carlisle requires that the bubbles intersect before each bubble achieves its maximum radius. Carlisle, col. 3, lines 58-60. In sum, Knudsen did not duplicate or appropriately model Carlisle's spacing.

Knudsen's conclusion that Carlisle would "not be effective in eliminating the secondary pressure pulse" also directly contradicts data contained in Knudsen. The Knudsen data point for the two-radii horizontal bubble spacing, although not a completely accurate model of Carlisle, shows a 30% reduction of the secondary pressure pulse. Knudsen at 45, Table 4. This data point represents the only point where Knudsen approximates the spacing shown in Carlisle. At that point, Knudsen confirmed Carlisle's teachings.

The Board found that Knudsen "did not test the Carlisle technique under conditions which are directly comparable to the Carlisle disclosure." Weighing the discrepancies between the Knudsen model and Carlisle's teachings, as well as Knudsen's tendency to confirm Carlisle where the model approximated Carlisle, the Board concluded: "we do not agree that Knudsen discredits Carlisle."

Because Knudsen did not accurately test Carlisle, an artisan of ordinary skill would not have dismissed Carlisle in light of Knudsen as a whole. It is far more likely that the skilled artisan would have afforded little weight to Knudsen itself. The Board

did not err in relying on Carlisle and discounting Knudsen.

## CONCLUSION

Knudsen is not so credible or persuasive of a contrary teaching that it would have deterred the skilled artisan from using the teachings of Carlisle. The examiner's use of Carlisle in his rejection of Young's claims is not clearly erroneous. The Board's decision affirming the examiner's rejection is therefore *AFFIRMED*.

FNal Mathematically, D is defined by  $1.2 R \leq D \leq 2.0 R$ .

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18 U.S.P.Q.2d 1089

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